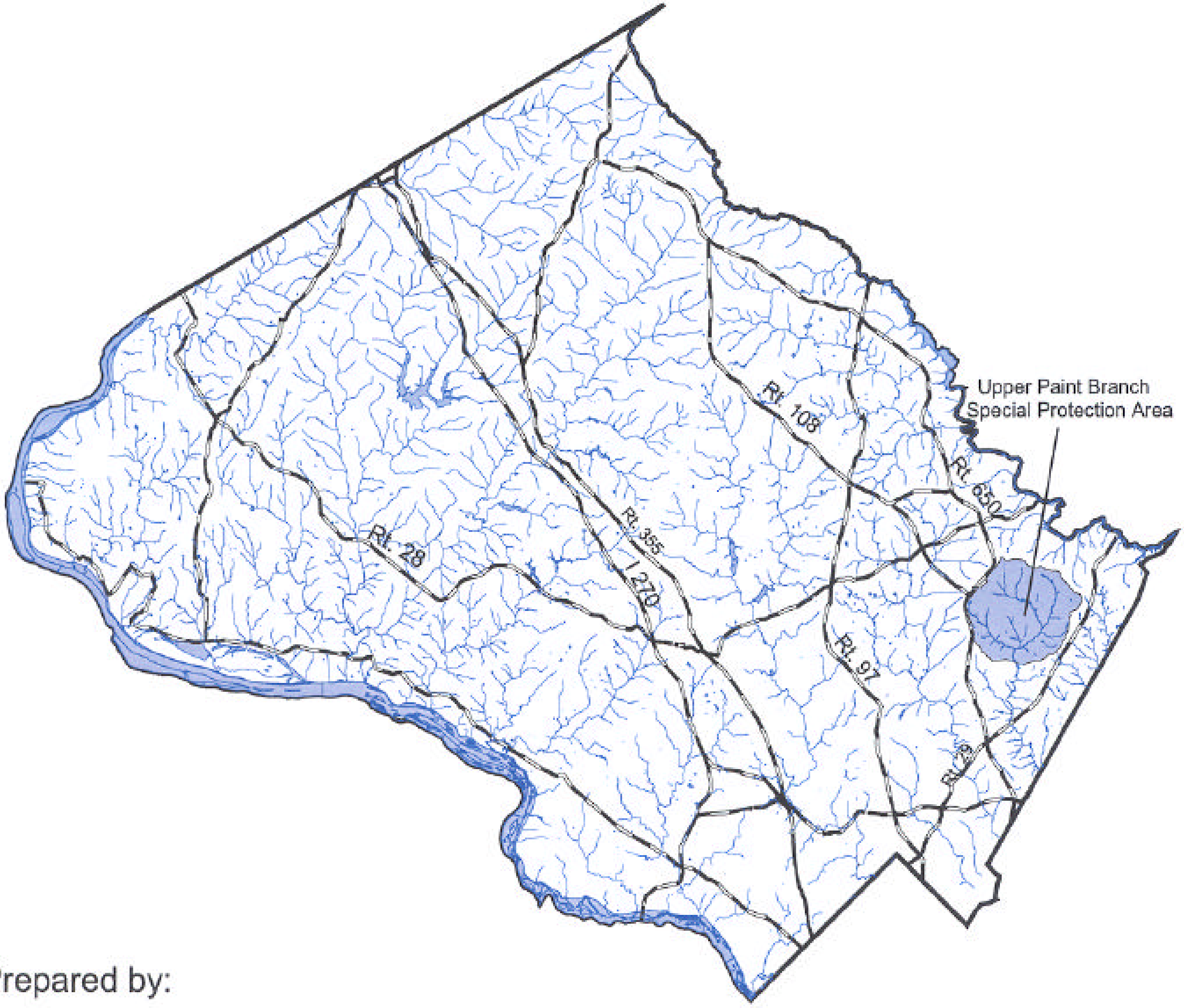
Special Protection Area Conservation Plan For Upper Paint Branch



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1.0 INTRODUCTION

Chapter 19, Article V of the Montgomery County Code requires that the Department of Environmental Protection (DEP) prepare a conservation plan for each Special Protection Area (SPA). The purpose of the conservation plan is to:

1) Describe the current status of aquatic living resources, physical stream habitat and water chemistry conditions within each SPA watershed,
2) Identify critical natural resource parameters which must be protected to maintain a high level of water quality protection throughout the Upper Paint Branch SPA that, at a minimum, meet established State water quality standards as defined in COMAR 26.08.01-.04,
3) Provide guidance for development of site specific performance goals that;
    a) Protect, maintain, and restore water quality, natural stream environments, and the ecological balance of aquatic communities.
    b) Mimic natural watershed processes.
    c) Stimulate innovative and integrated applications of site plan, sediment control, and stormwater management measures to limit changes to natural hydrology, reduce the on-site generation of pollutants that impact water quality, and mitigate impacts on adjacent and downstream conditions.
    d) Develop better measures of assessing BMP effectiveness.
    e) Seek improved best management practice designs with higher effectiveness to protect water quality and minimize maintenance.
    f) Protect downstream receiving waters.

Performance goals are criteria established for each SPA development project to enhance protection of on-site water resources or other features relating to those water resources. Performance goals for streams are expressed as narrative or numeric targets which represent biological, physical, and chemical measures of stream health to be achieved or maintained. Performance goals for best management practice effectiveness are expressed as narrative or numeric targets for achieving base flow preservation, peak storm flow reduction, and pollutant removal. Performance goals may also include measures that quantify the effectiveness of public education measures to reduce on-site generation of non-point source pollution.

Examples of critical natural resource parameters include, but are not limited to: watershed hydrology, stream channel morphology, water quality (temperature, pH, dissolved oxygen), aquatic habitat (for both fish and benthic macroinvertebrates), and sediment loading. This conservation plan is derived from baseline and reference stream monitoring conducted by DEP in accordance with the stream monitoring program and, as deemed appropriate, from previously conducted water quality inventories, technical studies, and functional master plans which contain credible information on water quality, aquatic life, watershed hydrology, and riparian conditions.

The SPA Conservation Plan provides essential guidance for the subsequent development of site specific performance goals. These site specific performance goals are developed during the pre-application meeting between the applicant, the Department of Permitting Services, the Department of Environmental Protection, and the M-NCPPC. At the pre-application meeting, site specific performance goals are derived from the Conservation Plan and presented to the applicant for use in the development of the site layout. The applicant provides a map identifying the location of important natural resource areas within the site that need to be preserved in order to maintain the existing high water quality. These include the location and rating of infiltratable soils, a forest stand delineation and natural resources inventory that includes stream buffers, erodible soils and areas of steep slopes, the location of all field delineated intermittent and perennial springs, seeps, and wetlands, and a drainage area map that shows the upstream drainage area, hydrologically important fractures, and the location of existing developed areas and BMP's in the subwatershed. Once these important natural resource areas have been delineated and protected, then a site plan can be designed so that development is placed around the natural resource areas with minimal impact. Through the SPA process, innovative site layouts and linked best management practices are required to maximize the protection of water quality, stream habitat, and aquatic life.

This conservation plan will describe the resource condition within the Paint Branch SPA, those critical natural resource parameters which must be protected in order to maintain its present condition, and the methods used to evaluate those critical natural resource parameters.

2.0 DESCRIPTION OF UPPER PAINT BRANCH WATERSHED

The Upper Paint Branch SPA encompasses the entire watershed above Fairland Road (approximately 7.5 sq. mi.) and is generally divided into five (5) subwatersheds; Left Fork, Right Fork, Gum Springs, Good Hope, and the Mainstem (figure 1). Land use in these subwatersheds includes low and medium density residential communities with some commercial and agricultural activities interspersed. Much of the development was built prior to stormwater control requirements, and streams in these older developed areas show signs of impairment. Large areas of forested parkland serve to protect the riparian area throughout much of Upper Paint Branch as well as keeping overall watershed impervious low. This forested parkland and the purchase of additional parkland is critical to maintaining the high quality stream condition throughout much of Upper Paint Branch.

The Paint Branch watershed is recognized as a unique aquatic resource in Montgomery County due to its ability to support a reproducing brown trout (*Salmo trutta*) population in a largely suburban setting. Numerous surveys have been conducted by State, local, and regional agencies since the 1970's to assess and track the trout population in Paint Branch. Findings of many of these surveys have been summarized in the <u>Upper Paint Branch Watershed Planning Study - Technical Report</u> prepared by the Maryland-National Capital Park & Planning Commission (M-NCPPC, 1995) and in the <u>Countywide Stream Protection Strategy</u> (DEP, 1998). These surveys clearly document the important role of the Good Hope, and Gum Springs tributaries as the primary spawning and nursery areas for brown trout in Paint Branch.

3.0 NATURAL RESOURCE CONDITIONS IN PAINT BRANCH

Beginning in 1994 DEP has monitored the aquatic resource at 11 fixed stations within the Upper Paint Branch SPA (figure 1). Monitoring parameters include fish, aquatic insects, qualitative and quantitative habitat, and water quality. Temperature is continuously monitored during summer months at selected sites.

This monitoring effort has provided further understanding of the resource condition throughout Upper Paint Branch. Findings from this monitoring are presented in the following sections.

3.1 CONDITION OF BIOLOGICAL COMMUNITY

To assess and track the condition of the aquatic biological community DEP has developed an interim Index of Biological Integrity (IBI) for both the benthic macroinvertebrate and fish communities that is specific to the Montgomery County region (see section 4.1). An IBI is a method of biological community assessment based on measurements of community attributes that respond in measurable and predictable ways to impairment.

Condition of the biological community at each of the 11 monitoring stations, expressed as IBI score, is presented in figure 2. This figure shows that the biological community in most of Upper Paint Branch SPA is in the good to excellent scoring range. Essentially this means that there are a high number of species (good diversity) that make up the fish and benthic macroinvertebrate communities and that intolerant species (those sensitive to degraded conditions) are present.

3.1.1 RIGHT FORK

The mainstem of the Right Fork supports good to excellent biological communities, however the Columbia Park Tributary (PBRF-118, figure 1) does not supply enough baseflow, particularly during dry years, to provide the habitat necessary to sustain a fish community of equal quality to that found in the mainstem. However, monitoring the benthic macroinvertebrate community in this tributary has shown that conditions are very close to those found in other areas of the Right Fork. This suggest that water quality in this tributary is similar to that found throughout the Right Fork.

3.1.2 LEFT FORK

The Left Fork above the fish blockage at Maydale Nature Center (PBLF202) supports biological communities that score in the good/fair range for the fish and consistently good for the benthic macroinvertebrates. The lowered fish score is likely the result of both degraded habitat and the fish blockage at Maydale Nature Center.

Below Maydale Nature Center (PBLF203) the fish scored in the good/excellent range while the benthic macroinvertebrates scored in the fair/good range. The habitat in this area of the Left Fork is in good shape for maintaining a diverse fish community. Adult brown trout were found at this station in 1994 and young-of-year were found in 1996 indicating that this area is important to the continued survival of this species. The somewhat lower score for benthic macroinvertebrates may be related to temperature impacts from the ponds at Maydale and the large wet pond stormwater management facility located on Rainbow Dr. DEP will conduct further temperature monitoring in the Left Fork to determine if and where thermal impacts exist.

3.1.3 GUM SPRINGS

Biological monitoring within the Gum Springs subwatershed has documented the recovery of the aquatic communities from several acute impacts that occurred in 1994, 1995 and 1996. In 1994, sediment from the High Zone water main construction discharged into Gum Springs below Bart Drive. In 1995, sewerage overflowed into Gum Springs above Bart Drive due to a blocked manhole. In 1996, an impact of unknown origin occurred in the vicinity of Fireside Drive that resulted in excessive algea growth on the stream substrate. These concurrent year impacts severely degraded the biological community in Gum Springs as indicated by monitoring results at station PBGS111 (figure 2). 1997 monitoring revealed improvement in both fish and benthic macroinvertebrate communities. Brown trout young-of-year were found in 1997 indicating trout are using upper Gum Springs for spawning.

Downstream at station PBGS206 the fish community has remained excellent during the three years of monitoring. The consistency in the fish community is likely due to the close proximity of this station to the Paint Branch mainstem which provides refugia for fish to escape poor water quality conditions. Fish can quickly reoccupy this area when water quality improves. The benthic community showed a major decline between 1995 and 1996, most likely in response to the above mentioned impacts. The failure of the benthic community to rebound from these impacts in 1997 is a concern and may be related to thermal impacts from Oak Springs wet pond.

3.1.4 GOOD HOPE

The Good Hope Tributary provides the main spawning and nursery habitat for brown trout in Paint Branch. Maryland, DNR has monitored this tributary (along with other areas in Paint Branch) since the 1970's and have consistently found young-of-year brown trout in the mainstem between Piping Rock Rd. and the mouth of this tributary.

DEP has monitored the biological community annually at two stations in Good Hope beginning in1994. Lower Good Hope tributary (below Good Hope Road) has consistently supported good/excellent biological communities. The Upper Good Hope has consistently supported a good benthic macroinvertebrate community. The fish community however, indicates some impairment which could be related to the fact that much of the development in the Piping Rock Drive area has no stormwater management. The lack of stormwater control in this area has resulted in high steep banks that are vulnerable to further erosion and sediment deposition below Piping Rock Rd.

Although brown trout young-of-year have been found in upper Good Hope (up to Piping Rock Rd), these impacts pose a serious threat to the continued success of brown trout reproduction in this subwatershed. DEP, through the Capital Improvements Program, has addressed this issue.

3.1.5 PAINT BRANCH MAINSTEM

Biological monitoring at two mainstem stations reflect overall cumulative impacts from the entire Upper Paint Branch watershed. Results of monitoring just above Briggs Chaney Road (PBPB302) indicate the overall resource condition is good to excellent. Both fish and benthic macroinvertebrates score in the good/excellent range. Adult Brown trout are consistently found and young-of-year are occasionally found at this station.

Results of biological monitoring at Fairland Road (PBPB305) indicate a wide range of scores between the fish and benthic macroinvertebrates. The fish community has remained in the good/excellent range. Brown trout adults have been found each year of monitoring while young-of-year were found in 1994 and 1997. Results of monitoring the benthic macroinvertebrate community reveal a wide range of IBI scores. This is because the sample taken in 1995 did not contain the minimum number of individuals needed to calculate the IBI score and therefore received a poor score by default. The low number of individuals is likely the result of some disturbance to the riffle from which the sample was obtained. For example, a high flow event may have created enough disturbance to remove many of the aquatic insects. However, the sample did contain intolerant taxa indicating that water quality was not the cause of the low number of individuals in the sample. Subsequent monitoring in both 1996 and 1997 found high numbers of individuals and IBI scores in the good range.

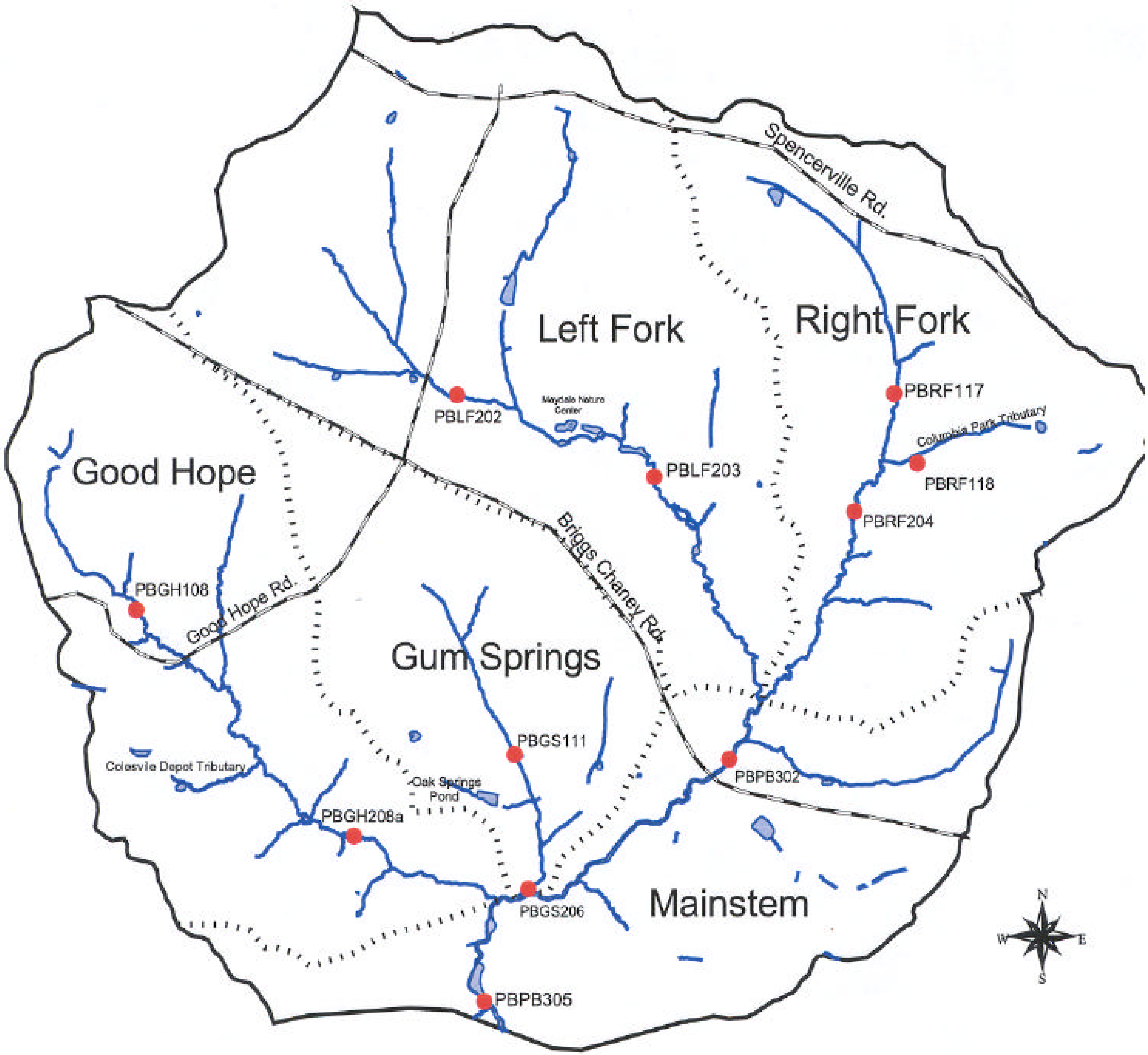
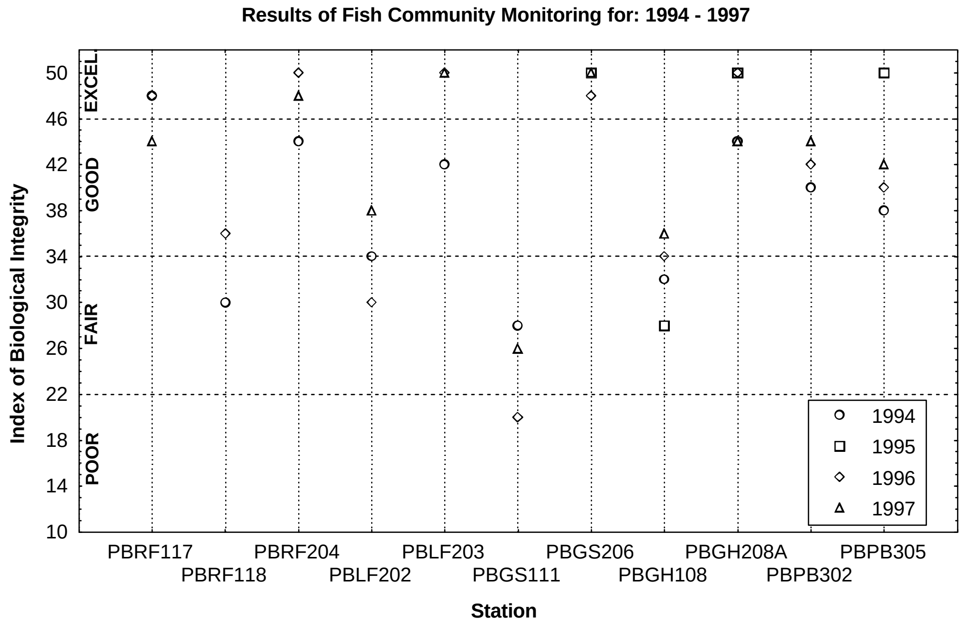


Figure 1. Upper Paint Branch Special Protection Area map



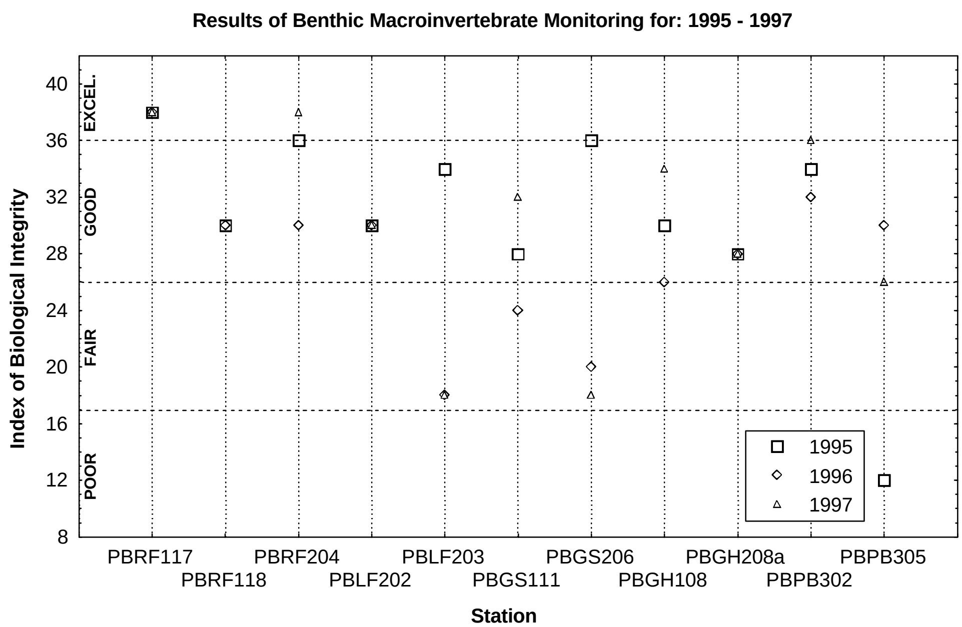


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Figure 2. Results of Biological Monitoring in the Upper Paint Branch SPA

3.2 HABITAT MONITORING

3.2.1 QUALITATIVE HABITAT ASSESSMENT RESULTS

In Upper Paint Branch, the overall habitat condition has remained good/excellent among all monitoring stations during all years of monitoring (figure 3). There is one exception to this trend, the headwaters of the Left Fork subwatershed, above Maydale Nature Center (PBLF202) where habitat condition is fair. The lowered habitat rating in this area is due to the lack of forested buffer, poor bank stability and lack of instream cover for fish.

Other impacts to habitat quality in Upper Paint Branch have been documented. These include inadequate forest buffer on portions of the Gum Springs subwatershed, eroding banks in Upper Good Hope and on the mainstem above Fairland Road, and sediment deposition in the Good Hope and Right Fork subwatersheds. Sediment deposition in the Good Hope and Right Fork subwatersheds is very much a concern due to the importance of these two subwatersheds to the brown trout population and the overall ecological health of the Upper Paint Branch watershed.

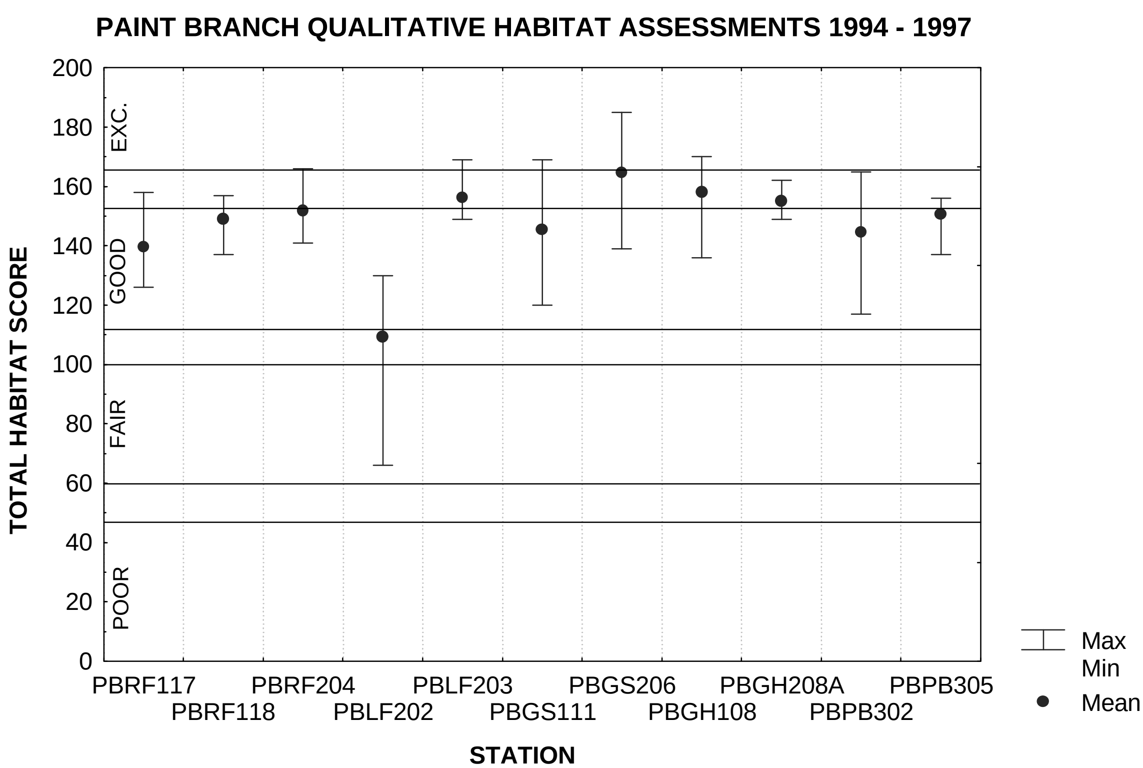

Figure 3. Results of Qualitative Habitat Assessment

3.2.2 QUANTITATIVE HABITAT ASSESSMENT RESULTS

Quantitative habitat assessment involves taking measurements of various stream habitat parameters within a 75 meter stream segment (ie. Length of pool/ riffle/ run habitat, riffle substrate size, bank height, percent vegetative cover on banks and cross sectional area of the stream channel). These habitat measurements provide a quantitative method for determining achievement of performance goals. Quantitative measurements of the stream channel have been taken at all stations in Upper Paint Branch SPA in 1994, 1996 and 1997. Results of this monitoring indicate very little change in channel morphology at most stations. The stream channel at station PBPB302 for example has experienced virtually no change in channel morphology (figure 4).

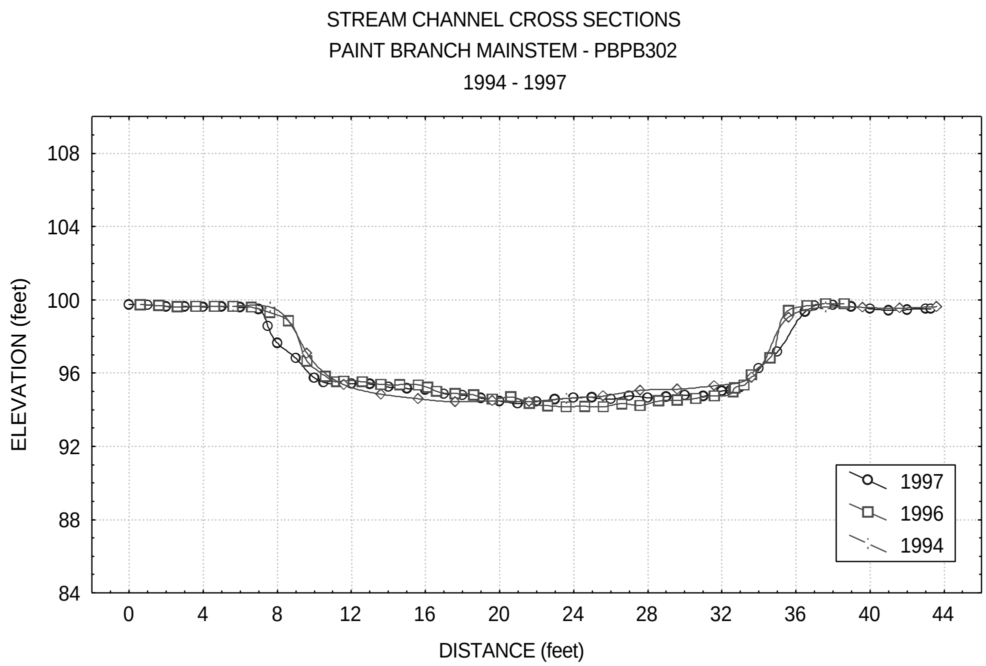

Figure 4. Stream channel cross sections taken from station PBPB-302

There are however, areas in the Upper Paint Branch where change in channel morphology has been observed over the three year period. These areas include the Upper Left Fork at station PBLF202 (figure 5), Upper and Middle Good Hope (figures 6 and 7), and Gum Springs (figure 8). Much of this change is likely in response to uncontrolled stormwater runoff from development in these areas that predate stormwater management requirements. DEP has initiated a systematic approach to identify these problems. This effort, funded through the Capital Improvements Program, has resulted in the *Upper Paint Branch Watershed Stormwater Management/Stream Restoration Assessment Report*, which identifies 67 projects throughout the watershed to address existing problems of habitat degradation. Six of these projects, in the Good Hope subwatershed, are currently in design and will address the causes of channel instability in this very important and fragile tributary.

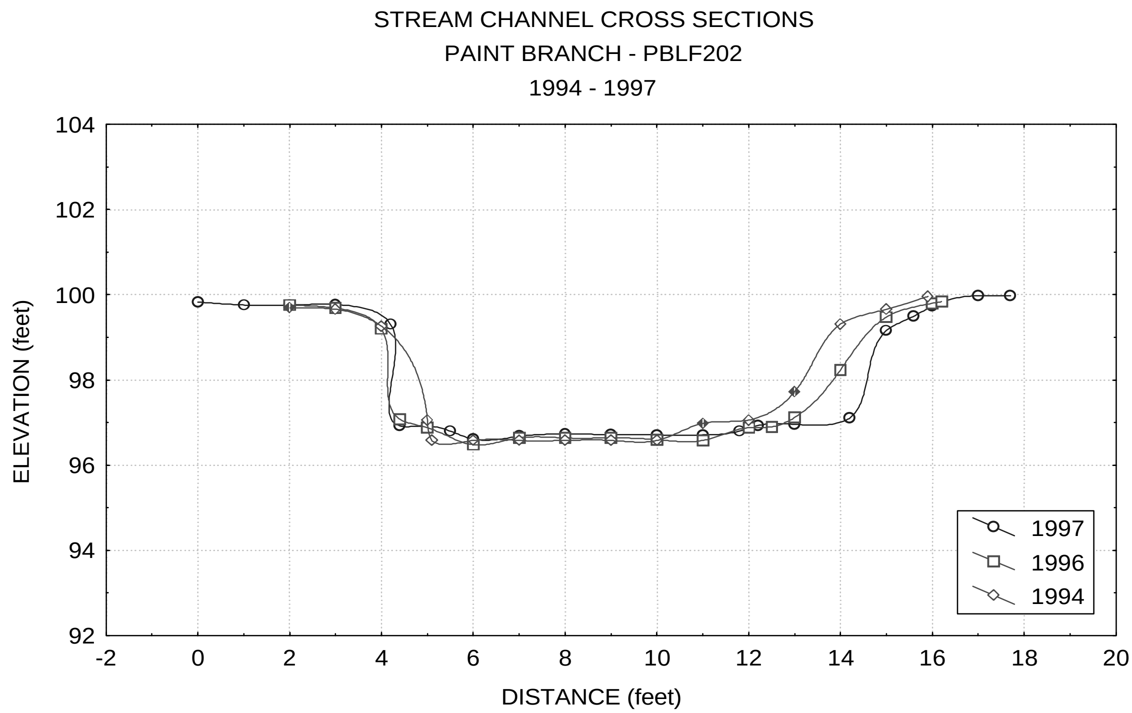

Figure 5. Stream channel cross sections taken from station PBLF202 on the Left Fork

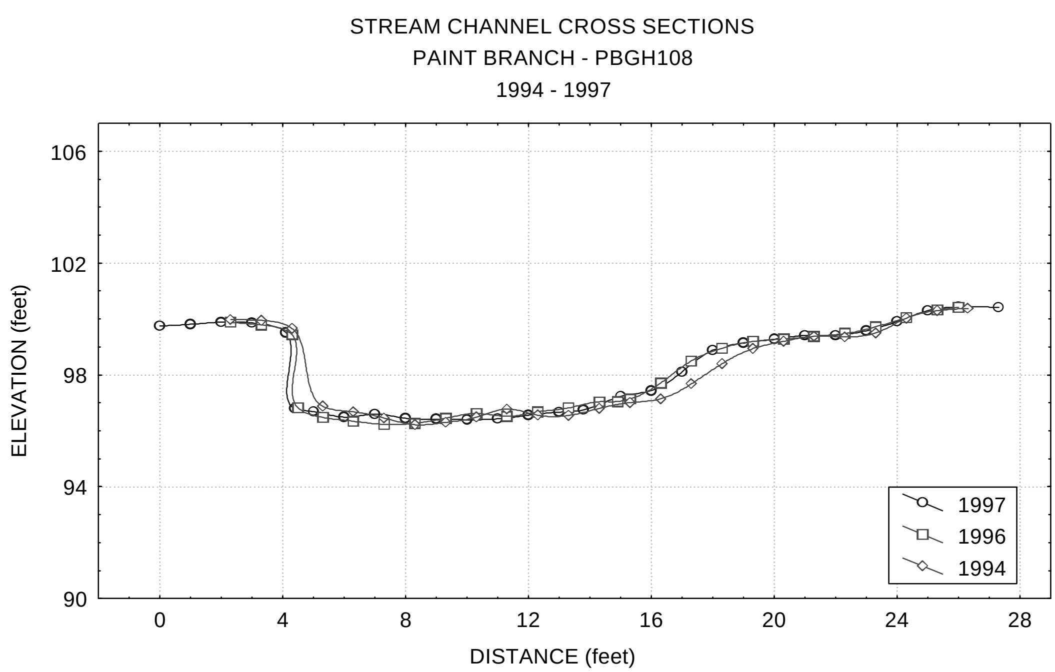

Figure 6. Stream channel cross sections taken from upper Good Hope (station PBGH108)

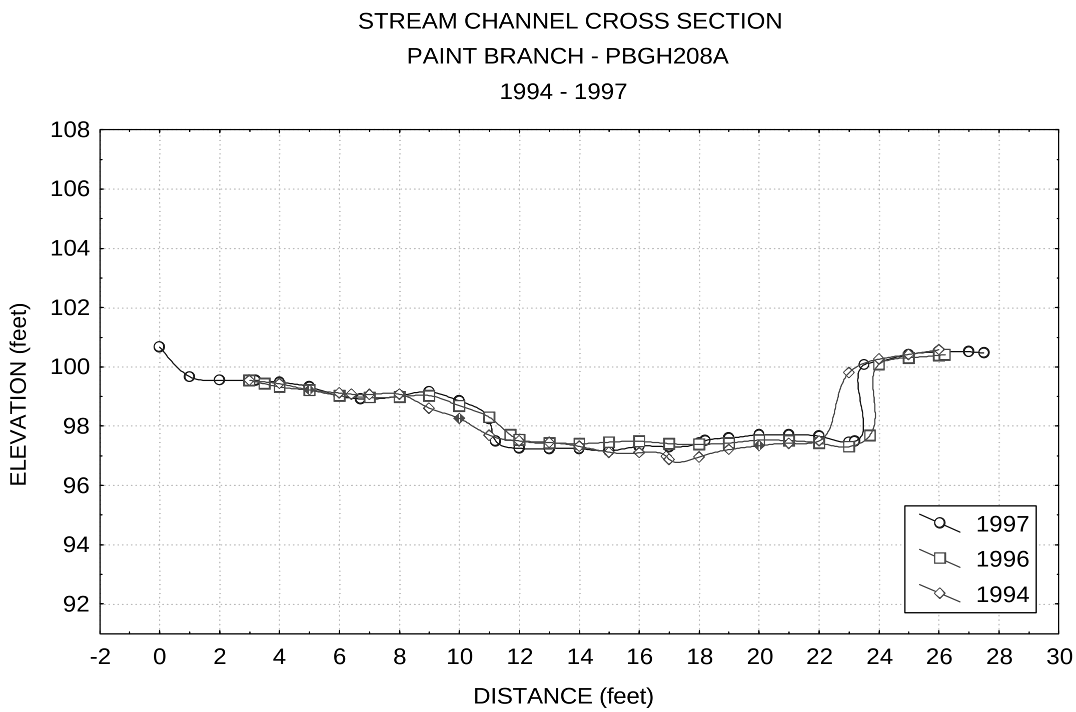

Figure 7. Stream channel cross sections taken from lower Good Hope (station PBGH208a)

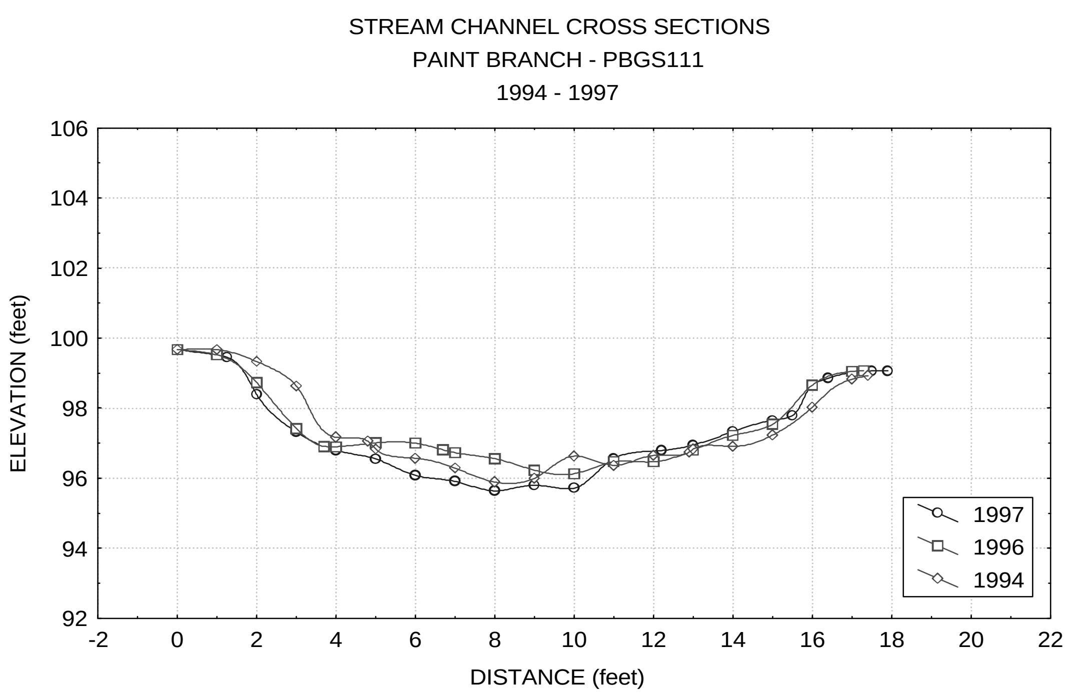

Figure 8. Stream channel cross sections taken from Gum Springs (station PBGS111)

4.0 CRITICAL NATURAL RESOURCE PARAMETERS

Critical natural resources to be tracked for maintaining present conditions in Paint Branch are identified and discussed below. Performance indicators used to determine whether or not adequate protection of these resources is provided are also presented here. The performance indicators are derived from several years of monitoring conducted by DEP. Values given for each indicator represent the mean taken from a minimum of three years of data. DEP will determine achievement of performance goals based on whether or not indicator values derived from future monitoring remain within 1 standard error of the mean.

4.1 LIVING RESOURCES

Living resources within the stream reflect cumulative impacts of all natural and man induced stressors. DEP has developed an interim, reference condition based, Index of Biological Integrity (IBI) specifically for the Piedmont region within Montgomery County. The IBI compares specific attributes of streams representing the "best attainable condition" (reference condition) to the attributes of all other streams within the County. By measuring how closely a stream compares to the reference condition, a relative assessment can be made of the resource condition of the stream. The IBI rates the resource condition as excellent, good, fair, or poor. An excellent rating being equivalent or comparable to the reference condition, while a poor rating would indicate a condition having little or no similarity to the reference condition. This interim IBI has been developed for two biological groups, fish and aquatic insects. Final validation, calibration and testing of the IBI is scheduled to be completed during the winter of 1998-99.

4.2 WATERSHED HYDROLOGY

Watershed hydrology plays a vital role in the ecological health of the stream and defines the shape and pattern of the stream channel. Watershed hydrology can be broken down into two aspects baseflow and stormflow. Baseflow is largely derived from groundwater. It can vary on both a daily and seasonal basis. Baseflows are most effected by the amount of rainfall and the amount of this rainfall that infiltrates into the ground and enters the water table. Storm flow is related to the amount of rainfall and the amount of rainfall that is not taken up by plants nor enters the water table. Stormflows are governed by the amount of surface runoff directly entering streams during storm events.

4.2a BASE FLOW

Baseflow of a stream is maintained through a constant supply of ground water that passes through the subsurface layer of the surrounding watershed making its way to low spots and ultimately to the stream. During times of drought when little or no water is reaching the water table, baseflows decrease. In times of increased rainfall groundwater levels can rise and increase baseflow. The amount of baseflow in a stream determines the amount of habitat available to aquatic life. During times of low baseflow there is a reduction in aquatic habitat, the converse is true in times of high baseflow. As a watershed is developed, and impervious surfaces account for more land coverage, the ability of the watershed to absorb water is diminished. Groundwater levels are lowered and consequently sustain lower baseflows in the streams.

4.2b STORM FLOW

Storm flow is related to the amount of rainfall and the amount of rainfall that is not taken up by plants nor enters the water table. Stormflows are governed by the amount of surface runoff entering the streams. The land cover, be it agricultural, developed, or forested determines the amount of surface runoff. In a mature forest, even during a heavy rainfall, very little water runs off the land. That water that does runoff is greatly slowed by the organic matter covering the ground. As vegetative cover is removed, such as in agriculture, a much greater amount of rainfall runs off the land leading to higher storm flows in stream channels.

Commercial and residential development, not only leads to a loss of vegetative cover but also increases the amount of impervious surfaces, as roads, parking lots, and driveways are paved and buildings are constructed. Due to this increase in impervious area, the amount of runoff from rainfall events increases significantly. Large Increases in the volume of water entering streams during storm events can have significant detrimental effects on stream channels and can lead to stream channel erosion.

The susceptibility of a channel to erosion during storm events is dependent upon the type of materials that make up the streambed and banks. If the stream bed is not sufficiently armored with large substrate materials such as large cobbles and boulders or made up of a cohesive material, the channel will begin to downcut, a process that is referred to as stream incision. Stream incision is one the most serious alterations that can happen to a stream channel. As the stream channel deepens, the flood flows that formerly left the channel and flowed over the flood plain are now confined to the channel. These confined flood flows are extremely erosive and damaging to stream habitat. Streams where frequent flood flows are confined to their channels are referred to as entrenched streams.

Stream incision results from an increase in the volume of water flowing in a channel. If a channel of a given size is forced to convey a greater volume of water during storms, the only way to convey this increased volume is to increase the waters velocity. This increases the erosive force on the channel bottom, causing stream incision. Stream incision occurs as a point of active down cutting that migrates in an upstream direction. The point at which the down cutting is occurring is referred to as the nick point. This nick point will continue to migrate upstream until it reaches bedrock or a large structure such as a bridge culvert or dam. A nick point can lower a streams invert by a few inches or a few feet depending on the underlying bed material

As the nick point moves upstream, the stream channel deepens and the streambanks become excessively high. The lowering of the streams base level lowers the local water table drying the upper portions of the bank resulting in the replacement of densely rooted riparian vegetation with weakly rooted upland species, further weakening the stream banks. Over time the banks fail and the channel begins to widen. The process of channel incision and widening can occur rapidly or over a period of decades.

If the channel bottom is armored with large substrate material or lies on bedrock, channel incision may not occur. But the increase in velocity still increases the erosive forces on the stream banks. This will also result in stream channel widening as the channel adjusts to its new storm flow regime.

If channel widening occurs due to higher stormflows, there is also an effect that mimics that of a baseflow reduction. The wider channel will still have the same volume of baseflow in it. But due to the larger channel, this baseflow will fill a smaller portion of the enlarged channel than it did prior to the channel widening. This reduces the available aquatic habitat, limiting the biology.

In order to monitor for changes in the hydrology, DEP will utilize stream channel measurements taken over time at fixed points throughout the watershed. From these measurements several statistical relationships can be calculated and used as performance indicators to assess stability of the watershed hydrology. These performance indicators include:

4.2.1 Width/Depth Ratio

Width/depth ratio is obtained by dividing bankfull width by mean bankfull depth. This ratio provides a quantitative method to look for changes in stream channel dimensions. Width/depth ratios should remain consistant if no significant alteration to the watershed hydrology occurs. However, increasing the high flow events will lead to channel incision or widening or both and thus increase the width/depth ratio.

4.2.2 Entrenchment Ratio

This is essentially a measure of the degree to which a stream channel is downcut or incised into the valley floor. Entrenchment ratio is derived by dividing the flood-prone width by the bankfull width. The flood prone width is considered to be the width of the flooding stream at two times the maximum bankfull elevation. The entrenchment ratio is important as it is essentially a measure of how accessible a stream is to its floodplain. It is important that a stream remain accessible to the floodplain so the erosive energy associated with flooding events is dissipated and sediment is deposited in the floodplain rather than in the channel. Stream channels with an entrenchment ratio of 1.0 - 1.4 are considered entrenched and thus have lost accessability to the floodplain, a ratio of 1.4 - 2.2 is considered moderately entrenched and a ratio of >2.2 is considered slightly entrenched. A decreasing entrenchment ratio would indicate the stream is downcutting relative to its floodplain.

4.2.3 Percent of Wetted Width

Measurements of channel width and wetted width are taken and reported as percent of channel that is wetted. Decreased wetted width in relation to channel width will result in increased exposure of the stream substrate to warming and increases to stream temperature. Increases of stream temperature in Paint Branch will threaten the cold and cool water conditions necessary to maintain the healthy ecosystem now prevalent in the watershed.

4.3 INSTREAM HABITAT

Hydrology and sediment load are major determinants of the physical stream habitat. In addition to these two parameters, the land use immediately adjacent to a stream channel also plays a large role. The presence of a wooded buffer is important to the stream habitat in that it provides large woody debris (ie. trees limbs, trunks, root wads). In a mature stream side forest, as the older trees age and die, they often fall or are washed into the stream. In the stream, this large debris alters the flow, creating scour pools, fish cover, as well as colonization areas for macroinvertebrates. Many of the traditional habitat improvement techniques actually try to mimic the influence of large woody debris (log drops, overhead cover, and wing deflector structures). Large woody debris is one of the single most important sources of fish habitat in Piedmont streams. When agricultural land uses or land development extends up to the stream banks, the source of large woody debris is lost. Even when new stream buffers are established, decades pass before trees become old enough to begin dying and providing a new source of large woody debris.

Hydrology, sediment load and large woody debris determine, to a great extent, the amount and types of habitat found in a stream. But aquatic life has additional needs that must be met, a food source being the most significant. In headwater streams, the primary source of energy input is small organic matter, bits of leaves, twigs, and plants, that fall or are washed into the stream. If there is not a diversity of micro and macrohabitat this debris is simply washed through the system before it can be utilized by stream life, if there is not adequate streamside vegetation, there is no source for this organic matter and the stream will not support a diverse aquatic community even if there is adequate habitat.

Individuals making up the aquatic community are adapted to existence in specific habitat types in the stream. For example, most aquatic insects and some fish species are specialized such that they require riffle habitat, while others require pool habitat. The interstitial spaces between rocks in the riffles provide shelter for many aquatic insects as well as surface area on which some fish species can attach egg masses. Additionally, the gradient and consequently the velocity is high through the riffle habitat causing turbulence which allows the water to absorb oxygen. Many aquatic insects and some fish species are dependant on both the high velocity and oxygen content for survival. It is critical that a regular sequencing of both pool and riffle habitat be maintained for the continued existence of a diverse biological community.

DEP measures each of these habitat types within the 75 meter fish sampling segment and reports the percentages of both pool and riffle habitat. In addition, measurements of bank height and vegetative cover are taken. These percentages along with one parameter taken from the qualitative habitat assessment (bank stability) are the indicators used to assess whether or not protection of instream habitat is accomplished.

4.3.1 Bank Stability

This indicator is taken from the qualitative habitat assessment conducted during each visit to a monitoring station. Bank stability is one parameter out of ten that make up the qualitative habitat assessment. The scoring range for this parameter is 1-20. A score of 0-5 is considered poor while 15-20 is optimal. Reduction in bank stability is an indication that flood frequency has increased.

4.4 WATER TEMPERATURE

This is an especially important natural resource parameter for Upper Paint Branch in that this is a class III natural trout stream. DEP monitors temperature with continuously recording temperature loggers placed in the stream and set to record at ten minute intervals during the warm months of June - September.

4.5 SEDIMENT LOAD

The movement of sediment through a stream is a natural process where rock eroded from inland mountain and piedmont regions is transported ultimately to the oceans either as suspended sediment[1] or depositional sediment/ bedload[2]. Under normal environmental circumstances the amount of sediment entering a stream equals the amount leaving it. Erosion from a meander bend on a creek equals deposition on the point bar opposite it. Under these conditions stream channel widths, depths, and cross-sections remain stable. When a shift occurs in the amount of sediment entering a stream on a long term basis, either an increase or decrease in sediment load, the channel must adjust to accommodate the new sediment load. If there is a significant increase in sediment load and the stream cannot transport all of the new sediment, deposition occurs (aggradation). If there is a significant decrease in the sediment load, erosion will exceed deposition and channel erosion will occur (degradation).

Initial land clearing activities undertaken without adequate sediment controls measures can allow large volumes of sediment to enter stream channels during storm events. A stream at a given flow has a defined capacity to transport sediment. When this sediment transport capacity is exceeded deposition occurs. The sediment will begin to accumulate in the channel, first filling pools then depositing in run and riffle areas. The result is that channel depth decreases and the channel becomes hydrologically smoother (more efficient). This is usually accompanied by channel widening. Over the long term, this process can also lead to an increase in the meander wavelength (becomes

[1] Suspended load is the fraction of sediment that remains mixed with the flowing water and causes the water to appear muddy.

[2] Bedload is the fraction of sediment comprised of larger particle sizes that are transported by sliding and rolling along the stream bed.

straighter). The result is a stream channel that is shallower, wider and straighter than previously.

Sedimentation and the subsequent changes in the physical characteristics of the channel have significant detrimental effects on the ability of the stream to support aquatic life. Sediments fill the voids between larger substrate particles eliminating habitat niches for aquatic macroinvertebrates, smothering fish spawning areas, and scouring submerged and emergent vegetation beds.
The process of sedimentation and widening creates a hydraulically smoother channel causing channel roughness to decrease. The roughness of the channel creates microhabitats of differing water velocities and depths and is a key habitat determinant for fish and macroinvertebrates. A diversity of microhabitats promotes diversity in the composition of the stream inhabitants. A channel that is hydraulically smooth, shallow, and wide will possess little diversity in microhabitats and thus supports fewer species.

A different process occurs if there is a significant reduction in the sediment load entering a stream. This can occur if an area becomes highly impervious or if there is an obstruction, such as a dam across a stream preventing the downstream migration of sediments. Stormwater running off paved surfaces has little sediment to transport. Flowing water has a certain sediment transport capacity. When stormwater entering a stream channel has excess sediment transport capacity, it will begin to remove and transport previously stored sediment within the stream channel. Initially this may appear beneficial as the finer sediments are removed from the channel. But, when this stored sediment is gone, the stream bed and banks become sediment sources for stormwater transport. The lack of sediment input, the increase in the volume of stormwater, and the increased capacity of the stormwater to carry sediment begins a process of stream bed degradation and channel erosion.

DEP will utilize several measurements taken during the quantitative habitat survey as indicators of change in the sediment load. These indicators include percent embeddedness, pool deposition, and pebble counts.

4.5.1 Embeddedness

Refers to the extent to which rocks (gravel, cobble, and boulders) and snags are covered or sunken into the silt, sand, or mud of the stream bottom. Generally, as rocks become embedded, the surface area available to macroinvertebrates and fish is decreased. Embeddedness is a result of sediment movement and deposition, and is a parameter evaluated in the riffles of streams. High quality streams will have embeddedness values of 20% or less.

3.5.2 Pool Deposition

Measurements are taken of sediment deposition in each pool within the 75 meter segment and are reported as an average for each station.

3.5.3 Pebble Count

Pebble counts are done to determine the size of particles (sand, gravel, cobble) making up the riffle substrate. Results of the pebble counts are then used to determine the median pebble size (D50). These measurements will be used to determine change in the stream substrate. It is especially important to maintaining the benthic macroinvertebrate community that the riffle substrate be comprised of a range of stone sizes. The presence of gravel and cobble size stone in a riffle provides the habitat for many benthic macroinvertebrates. As a stream degrades the D50 size particle will be lowered as more of the riffle substrate is made up of sand and silt size particles. This poses a major threat to the biological community.

5.0 PERFORMANCE GOALS FOR PAINT BRANCH SUBWATERSHEDS

This section identifies performance goals that are to be pursued in order to maintain a high level of water quality within each Paint Branch subwatershed. Included with the goals are indicators used by DEP to determine whether or not the goals are met. The values presented for each indicator are based on analysis of three years of field monitoring by DEP biologists and the selective use of other monitoring data collected in the Upper Paint Branch watershed. They are intended to provide a quantitative basis for assessing the level of protection afforded each natural resource parameter described in this conservation plan. To determine attainment of performance goals, DEP will look to see that indicator values derived from future monitoring data are within one standard error range of the mean.

5.1 RIGHT FORK PERFORMANCE GOALS

The Right Fork subwatershed has a drainage area of 941 acres, six percent of which is impervious surface, twenty two percent is forested. The Right Fork serves a critical role to the ecological health of Paint Branch in that it provides a constant supply of high quality, cool water to the mainstem, supports varied adult trout habitat, and provides spawning/nursery areas for brown trout.

5.1.1 Maintain present condition of living resources

Biological monitoring over a four year period (1994-97) indicate that overall an **excellent** resource condition exists within much of the Right Fork (figure 2). However, monitoring at station PBRF-118, located on the Columbia Park Tributary, indicate some decline in the biological community. This decline is most apparent in the fish community and is likely due to lower flows and lack of diverse fish habitat.

5.1.2 Maintain present hydrological characteristics

Performance indicators used to monitor for changes in the hydrological characteristics of the Right Fork are presented in the following table. Values calculated for each station should remain within one standard error range of the mean if hydrology is not altered.

Performance Indicators	Upper Right Fork (PBRF-117)			Timberlake Dr. (PBRF-204)			Columbia Park Trib. (PBRF-118)		
	Mean	N	Std. Error	Mean	N	Std. Error	Mean	N	Std. Error
% of channel width wetted	76.5	6	+/- 6.7	89.9	6	+/- 2.8	51.4	6	+/- 27.5
width/depth ratio	16.1	1	NA	9.9	1	NA	22.4	1	NA
entrenchment ratio	2.0	1	NA	1.4	1	NA	2.3	1	NA

5.1.3 Maintain or improve present condition of in-stream habitat

DEP measures the proportion of various habitat types (ie. pool, riffle, run) in a 75 meter segment of stream. Percentage of riffle and pool habitat presented in the following table are the indicators DEP will use to determine if any loss of these two important habitat types has occurred. Preservation of these two habitat types is critical to maintaining the diverse biological community that presently exists in the Right Fork.

Performance Indicators	Upper Right Fork (PBRF-117)			Timberlake Dr. (PBRF-204)			Columbia Park Trib. (PBRF-118)		
	Mean	N	Std. Error	mean	N	Std. Error	Mean	N	Std. Error
percentage of riffles	41.3	3	+/- 5.0	34.1	3	+/- 3.5	43.8	3	+/- 8.6
percentage of pools	18.3	3	+/- 1.8	29.7	3	+/- 1.2	18.9	3	+/- 3.8
% veg. cover (right bank)	40.6	6	+/- 15.2	80.0	6	+/- 11.6	98.5	6	+/- 1.4
% veg. cover (left bank)	90.1	6	+/- 8.9	81.1	6	+/- 10.2	52.6	6	+/- 8.4
bank stability	13	6	+/- 0.6	14.2	6	+/- 0.7	14.6	6	+/- 0.7

5.1.4 Maintain present water temperatures

DEP monitored water temperature in the Upper Right Fork during summer months of 1994 and 1996. These data show that baseflow temperatures stay below the 68^{0}F criteria set by the State Water Use Standards (COMAR 26.08.02.03-3) throughout the summer months. Brief temperature spikes do occur as a result of summer storm events (figure 9). A summary of temperature monitoring in the Right Fork is presented in the following table.

(summary period is from 8/1 - 9/30)

Location	N	Mean	Median	Max.	Min.	STD
PBRF-118 (Columbia Park Trib.) - 1996	1426	64.2	64.7	72.3	55.3	3.1
PBRF-204 (Timberlake Dr.) - 1996	1426	63.8	64.4	71.7	55.3	3.0

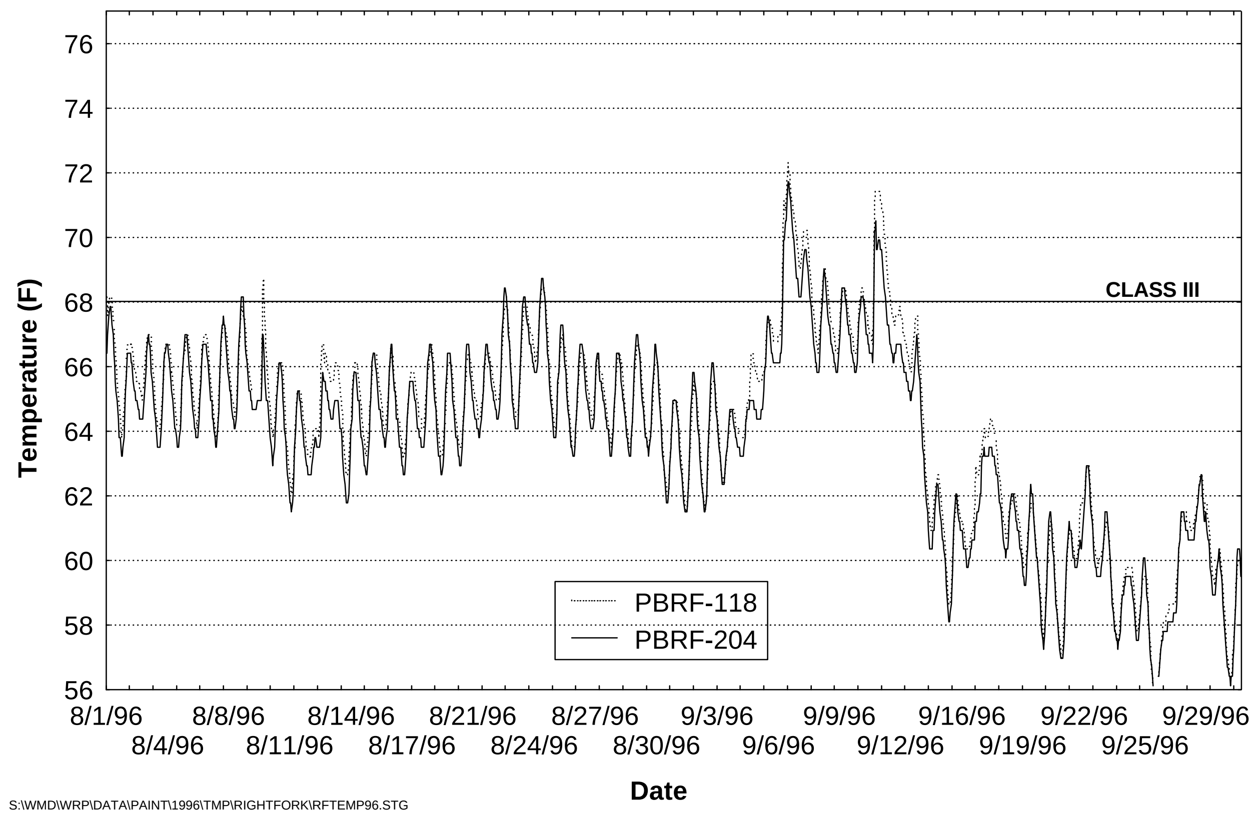

Figure 9. Water temperatures from two locations in the Right Fork subwatershed

Temperature monitoring throughout Paint Branch in 1996 indicate that water temperatures in the Upper Right Fork are among the coolest in the watershed. This trend is expected to continue and requires that new development in the Right Fork not create thermal impacts.

5.1.5 Maintain present sediment load

Current embeddedness values indicate that sediment is impacting the riffle habitat throughout the Right Fork. To maintain the high quality resource condition in this subwatershed it is absolutely critical that sediment loads remain at, or are reduced from, present levels. To determine if this requirement is met DEP will monitor the indicators listed in the following table.

Performance Indicator	Upper Right Fork (PBRF-117)			Timberlake Dr. (PBRF-204)			Columbia Park Trib. (PBRF-118)		
	Mean	N	Std. Error	Mean	N	Std. Error	Mean	N	Std. Error
percent of embeddedness	39%	2	NA	40%	2	NA	30%	2	NA
pool deposition (feet)	.02	6	+/- .01	.02	7	+/- .01	.07	5	+/- .04
D50	32mm - 64mm			16mm - 32mm			16mm - 32mm		

5.2 LEFT FORK PERFORMANCE GOALS

Drainage area of the Left Fork subwatershed is 1,400 acres, nine percent of which is impervious surface and twenty percent is forested. Overall conditions in this subwatershed indicate some impairment in the upper portions above Maydale Nature Center. This is due, in large part, to the lack of storm water management in the upper Left Fork subwatershed which has led to accelerated rates of channel erosion. The channel in this area (particularly between Good Hope Rd. and Maydale Nature Center) is incised and has lost access to the flood plain which will likely result in further bank erosion and sediment deposition downstream. In addition land owner encroachment into parkland along the stream corridor in this area has impacted the quality of the riparian zone. These present conditions of the upper Left Fork offer opportunity for remediation through stream restoration projects. Enforcement action to educate and remove encroachment from stream buffer will also be important.

5.2.1 Maintain present condition of living resources

Biological monitoring in the Left Fork found the fish community in the Upper Left Fork (above Maydale Nature Center - PBLF202) is fair/good while the benthic macroinvertebrates are consistently in the good range (figure 2). This slight drop off in the fish IBI scores is likely the result of both habitat impairment and the fish blockage at Maydale Nature Center. The fact that the benthic macroinvertebrate scores have remained in the good range indicate that water quality is not a limiting factor as aquatic insects sensitive to water quality impairment are present in this area.

Downstream of the Maydale Nature Center (station PBLF203) the fish community scores in the good/excellent range, while the benthic macroinvertebrate community is fair/good. The habitat in this area is much improved over that found in Upper Left Fork. Good habitat and being below the fish barrier are the primary reasons for the higher fish IBI scores in this area. The depressed score for the benthic macroinvertebrates could be related to thermal impacts from the ponds at Maydale Nature Center and the large storm water management wet pond located at Rainbow Dr. Temperature data taken during the summer of 1996 from station PBLF202 and PBLF203 does show thermal impact. DEP will conduct further temperature monitoring in closer proximity to the ponds to determine if any thermal impact exist.

5.2.2 Maintain or improve present hydrological characteristics

Indicators used to monitor for alterations to the hydrology of the Left Fork are presented in the following table. These values for PBLF-203 should remain stable over the years if the hydrology is not further altered. However, due to the entrenched stream channel at PBLF-202 change in all indicators is expected unless corrective action is taken.

Performance Indicators	Goodhope Rd. (PBLF-202)			Kinghouse Rd. (PBLF-203)		
	Mean	N	Std. Error	Mean	N	Std. Error
% of channel width wetted	87.7	6	+/- 3.8	64.7	6	+/- 7.8
width/depth ratio	8.8	1	NA	12.2	1	NA
entrenchment ratio	1.0	1	NA	2.5	1	NA

5.2.3 Maintain or improve present condition of in-stream habitat

The proportion of riffle habitat and the riffle to pool ratio is presented in the following table for two Left Fork stations. It is critical that these two habitat types remain stable in order to maintain the current resource condition of the Left Fork.

Performance Indicators	Goodhope Rd. (PBLF-202)			Kinghouse Rd. (PBLF-203)		
	Mean	N	Std. Error	Mean	N	Std. Error
percentage of riffles	42.9	3	+/- 3.5	21.7	3	+/- 2.7
percentage of pools	12.7	3	+/- 3.0	32.9	3	+/- 6.0
% veg. cover (right bank)	70.0	6	+/- 17.3	66.5	6	+/- 13.5
% veg. cover (left bank)	83.3	6	+/- 16.7	81.6	6	+/- 10.6
Bank Stability	10.4	7	+/- 0.8	14.0	6	+/- 0.7

5.2.4 Maintain present water temperature

A summary of water temperature data collected from the Left Fork during the summer of 1996 is presented in the following table and indicate that average stream temperatures are below the 68^0F class III criteria. However, the thermograph presented in figure 10 show brief temperature spikes (on 8/9/96 and 8/27/96) that exceed the class III criteria. These temperature spikes occurred at the same time as storm events indicating that they are related to stormwater runoff.

(summary period is between 8/1/96 - 9/30/96)

Location	**Mean**	**N**	**Median**	**Max.**	**Min.**	**STD**
PBLF-202 (Good Hope Rd.)	65.0	1426	65.5	71.7	56.1	3.0
PBLF-203 (Kingshouse Rd.)	65.1	1426	65.8	72.0	56.4	3.2

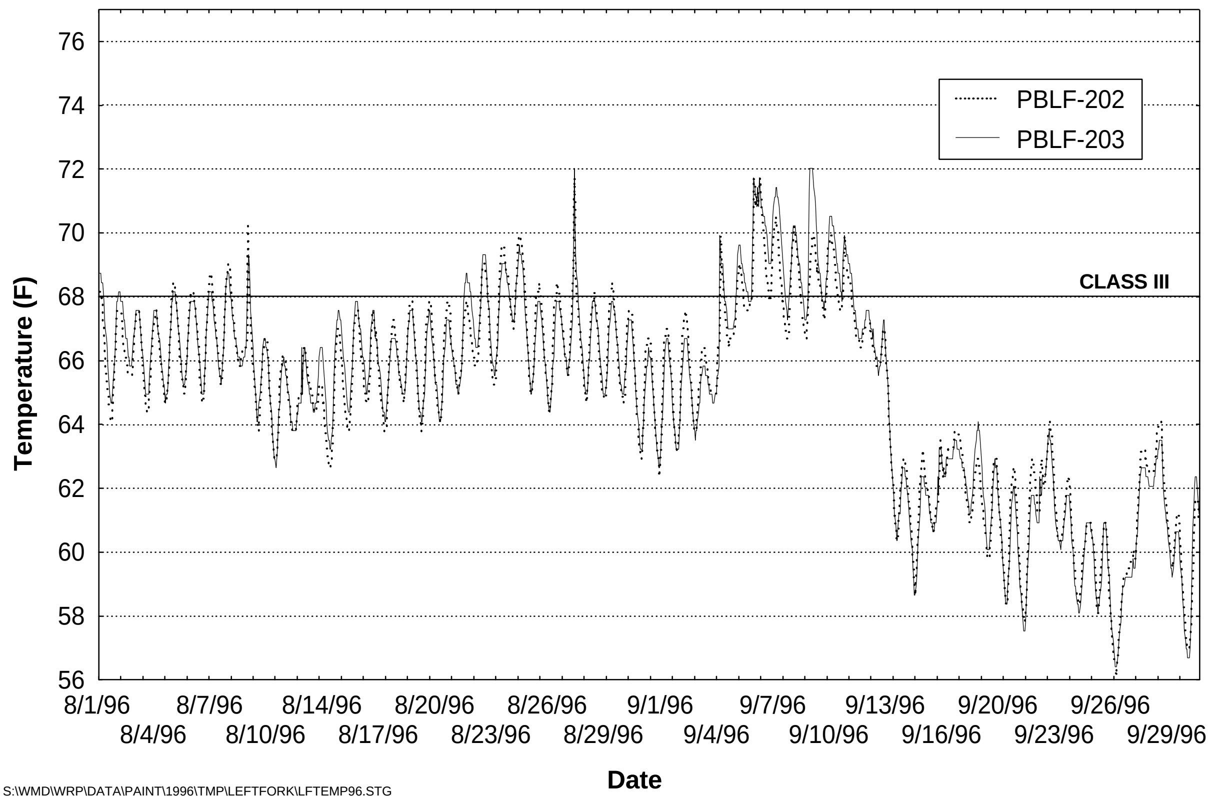

Figure 10. Water temperatures from two locations on the Left Fork.

5.2.5 Reduce present sediment load

Habitat in the upper reaches of the Left Fork (above Maydale Nature Center) is currently the most degraded in Paint Branch, a result primarily of sediment deposition from bank erosion. It is critical, therefore, to prevent any additional sediment getting into the stream channel and to reduce sediment load through bank stabilization practices where possible. Parameters used to determine if sediment loads are either reduced or remain at present levels are presented in the following table.

Performance Indicators	Goodhope Rd. (PBLF-202)			Kinghouse Rd. (PBLF-203)		
	Mean	**N**	**Std. Error**	**Mean**	**N**	**Std. Error**
percent of embeddedness	41%	2	NA	21%	2	NA
pool deposition (feet)	.00	4	+/- .00	.00	5	+/- .00
D50	32mm - 64mm			16mm - 32mm		

5.3 GUM SPRINGS PERFORMANCE GOALS

The Gum Springs subwatershed has a drainage area of 624 acres, thirteen percent of which is impervious coverage and twenty five percent is forest cover. Gum Springs is an important spawning and nursery tributary for brown trout as demonstrated by surveys conducted by MDDNR. For this reason it is critical that the overall water quality (particularly water temperature) be maintained. There are three storm water management facilities in the Gum Springs subwatershed, one of which (the Oak Springs regional wetpond) is a known source of thermal impact. DEP Plans to construct, through the Capital Improvements Program, a by-pass pipe to carry a portion of outfall from this pond to the mainstem of Paint Branch thereby reducing the thermal impact to Gum Springs.

4.3.1 Maintain or improve present condition of living resources

Biological monitoring indicate that a "**Fair**" resource condition exists in upper Gum Springs and a "**excellent**" resource condition exists in lower Gum Springs figure 2. The somewhat impaired resource condition of the upper portion of this tributary appears to be largely due to a sewage spill which occurred in the Spring of 1995 in the vicinity of Bart Dr. The result of this spill on the stream biota was a sharp decline in diversity and density of the benthic macroinvertebrate community and the loss of brown trout from upper reaches of Gum Springs tributary. Monitoring the benthic macroinvertebrate community in 1996 and 1997 indicate that the macroinvertebrate community has recovered to pre-spill condition. Brown trout young-of-year were collected from upper Gum Springs during 1997 fish monitoring indicating this region of Gum Springs is again surving as a nursery/spawning area for trout.

5.3.2 Maintain present hydrological condition

indicators used to monitor for alterations to the hydrology of Gum Springs are presented in the following table. These values are expected to remain within one standard error of the mean if the hydrology is not altered. The entrenchment ratio for station PBGS111 has not yet been obtained. The value for this indicator will be reported from 1998 monitoring.

Performance Indicators	Bart Dr. (PBGS-111)			Lower Gum Springs (PBGS-206)		
	Mean	**N**	**Std. Error**	**Mean**	**N**	**Std. Error**
% of channel width wetted	83.8	6	+/- 4.2	82.0	6	+/- 7.9
width/depth ratio	9.9	1	NA	15.4	1	NA
entrenchment ratio	NA	NA	NA	1.5	1	NA

5.3.3 Maintain present condition of in-stream habitat

Parameters used to determine if in-stream habitat structure remains in present condition are presented in the following table. These percentages must remain stable in order to maintain the diverse biological community that presently is found in Gum Springs.

Performance Indicators	Bart Dr. (PBGS-111)			Lower Gum Springs (PBGS-206)		
	Mean	**N**	**Std. Error**	**Mean**	**N**	**Std. Error**
percentage of riffles	39.4	3	+/- 9.9	36.9	3	+/- 6.9
percentage of pools	15.3	3	+/- 8.1	36.0	3	+/- 2.8
% veg. cover (right bank)	91.3	6	+/- 4.7	91.7	6	+/- 4.3
% veg. cover (left bank)	44.6	6	+/- 13.4	77.5	6	+/- 8.5
Bank Stability	13.6	7	+/- 0.4	15.3	6	+/- 0.7

5.3.4 Maintain present water temperatures

Water temperature data collected from Gum Springs during the summer of 1996 indicate that average baseflow stream temperatures are well below the 68^0F criteria in the mainstem. However, in the tributary that flows out of the Oak Springs wet pond water temperatures are elevated and remain above 68^0F for extended periods (figure 11). This raises the temperature in Gum Springs below the Oak Springs tributary and poses a threat to the biological community. DEP will address this thermal impact through the Capital Improvements Program.

A summary of temperature data from the Gum Springs subwatershed is presented in the following table. Upstream of the Oak Springs tributary water temperatures are among the lowest in Paint Branch. It is critical to the ecological health of this subwatershed and to the preservation of a viable brown trout population that water temperatures in Gum Springs remain low.

Location	Mean	N	Median	Max.	Min.	STD
Gum Springs (above the Oak Springs pond tributary) - 1996	62.0	5253	62.1	71.7	54.7	2.1
Gum Springs (In the Oak Springs pond tributary) - 1996	71.5	5253	72.3	79.1	59.5	3.8
Gum Springs (below the Oak Springs pond tributary) - 1996	64.3	5253	64.4	73.2	55.0	2.7

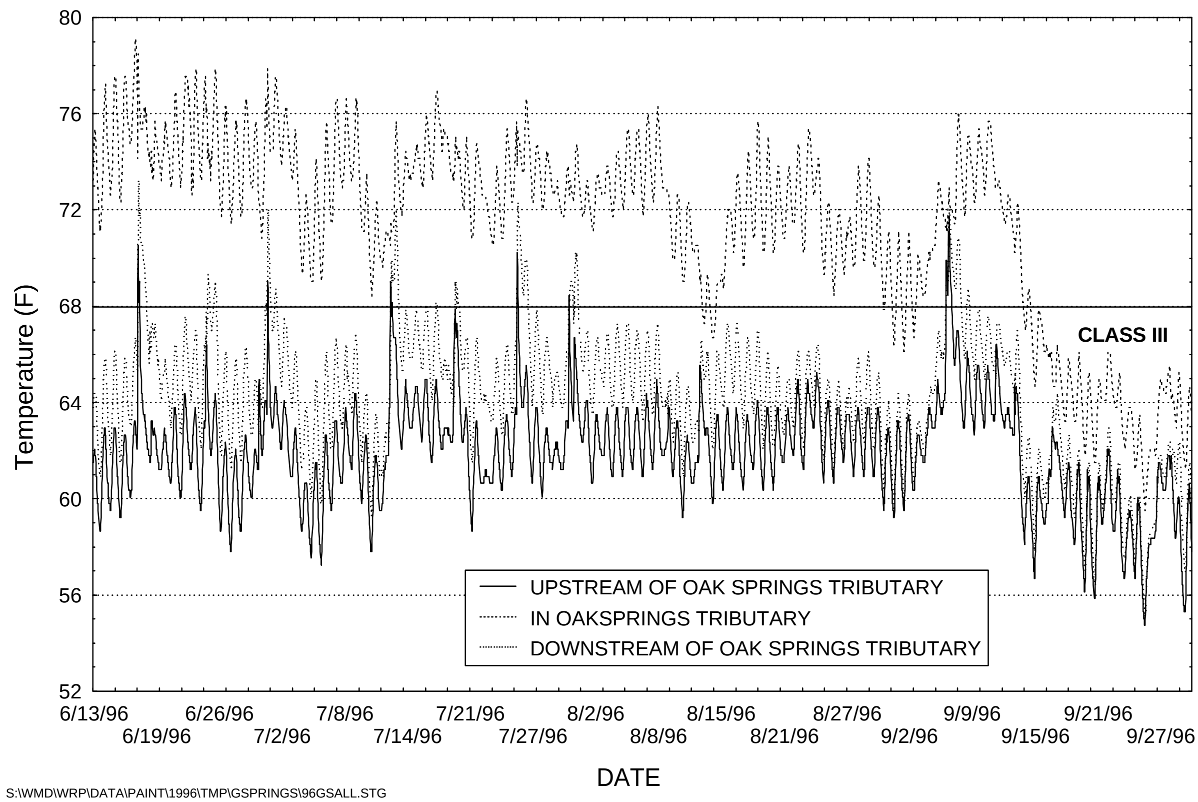

Figure 11. Water temperatures from Gum Springs (in vicinity of Oak Springs pond)

5.3.5 Maintain present sediment load

Maintaining or reducing present sediment loads is an important performance goal for Gum Springs given the significance of this subwatershed to preserving a viable brown trout population in Upper Paint Branch. To determine if this goal is met DEP will be using indicators listed in the following table.

Performance Indicator	Bart Dr. (PBGS-111)			Lower Gum Springs (PBGS-206)		
	Mean	**N**	**Std. Error**	**Mean**	**N**	**Std. Error**
percent of embeddedness	23%	2	NA	22%	2	NA
pool deposition (feet)	.00	4	+/- .00	.10	11	+/- .01
D50	32mm - 64mm			32mm - 64mm		

5.4 GOOD HOPE TRIBUTARY PERFORMANCE GOALS

The Good Hope subwatershed is 986 acres in drainage area of which approximately eight percent is impervious surface and fifty four percent is forest cover (highest proportion of forest cover in Paint Branch SPA). Good Hope tributary is the most important brown trout spawning/nursery area in the Paint Branch watershed. Its role as a reliable spawning/nursery area is well documented by the Maryland Department of Natural Resources. Adult and young-of-year brown trout are found from just below Piping Rock Dr. to the mouth of Good Hope tributary.

Continued success of brown trout reproduction in Good Hope is threatened by the fact that much of the development in the Piping Rock Rd. area predates county storm water management regulations and therefore has no storm water management. Consequently, the stream channel and aquatic habitat below Piping Rock Road is somewhat degraded. This degradation is evident by high steep banks and sedimentation. DEP is planning to either construct new stormwater control facilities or retrofit existing facilities at several locations in the upper portions of Good Hope to mitigate these impacts.

5.4.1 Maintain or improve present condition of living resources

Presently the macroinvertebrate and fish communities indicate that a "**good**" resource condition exists in upper Good Hope and a "**excellent**" resource condition exists in lower Good Hope (figure 2).

5.4.2 Improve present hydrology through reduction of peak runoff flows

Hydrological characteristics of the Good Hope subwatershed have been altered as a result of uncontrolled stormwater runoff from headwater areas. We are seeing changes in the stream channel as a result (figures 6 & 7). Plans are under way to put in a storm water management facility above Piping Rock Road to mitigate this impact. It is critical that any additional development in this subwatershed address this issue thouroughly. DEP will be monitoring the following parameters to determine the direction of change to the hydrology of this subwatershed.

Performance Indicators	Peachwood Park (PBGH-108)			Hobbs Dr. (PBGH-208)		
	Mean	N	Std. Error	Mean	N	Std. Error
% of channel width wetted	76.6	6	+/- 6.0	68.0	6	+/- 4.7
width/depth ratio	8.2	1	NA	12.6	1	NA
entrenchment ratio	1.2	1	NA	1.5	1	NA

5.4.3 Maintain present condition of stream habitat

Parameters used to determine if in-stream habitat structure remains in present condition are presented in the following table. These percentages must remain stable in order to maintain the diverse biological community that presently exists in Good Hope.

Performance Indicators	Peachwood Park (PBGH-108)			Hobbs Dr. (PBGH-208)		
	Mean	N	Std. Error	Mean	N	Std. Error
percentage of riffles	30.3	3	+/- 2.0	24.5	3	+/- 2.6
percentage of pools	26.6	3	+/- 5.3	45.8	3	+/- 9.1
% veg. cover (right bank)	52.8	6	+/- 19.3	45.0	6	+/- 12.9
% veg. cover (left bank)	66.2	6	+/- 5.8	48.9	6	+/- 7.9
Bank Stability	14.0	7	+/- 0.4	14.3	6	+/- 0.3

5.4.4 Maintain present water temperatures

DEP monitored water temperature in Good Hope tributary during the summer months of 1996 and 1998 at two locations: 1) PBGH108 in1998 (figure 12) 2) just upstream of the Colesville Depot tributary in 1996 (figure 13). A summary of this monitoring is presented in the table below and shows that the mean water temperature is below the 68^{0}F use III criteria. However, figures 12 and 13 show brief periods when water temperature does exceed the use III criteria. Any new thermal impact to Good Hope must be avoided in order to protect this very important and fragile tributary.

(summary period is: 6/1 - 9/30 for 1998 and 8/1 - 9/30 for 1996)

Location	Mean	N	Median	Max.	Min.	STD
PBGH108 (1998)	65.7	7350	66.4	72.6	54.7	3.5
Upstream of Colesville Depot tributary (1996)	63.0	1429	63.5	72.0	55.9	2.6

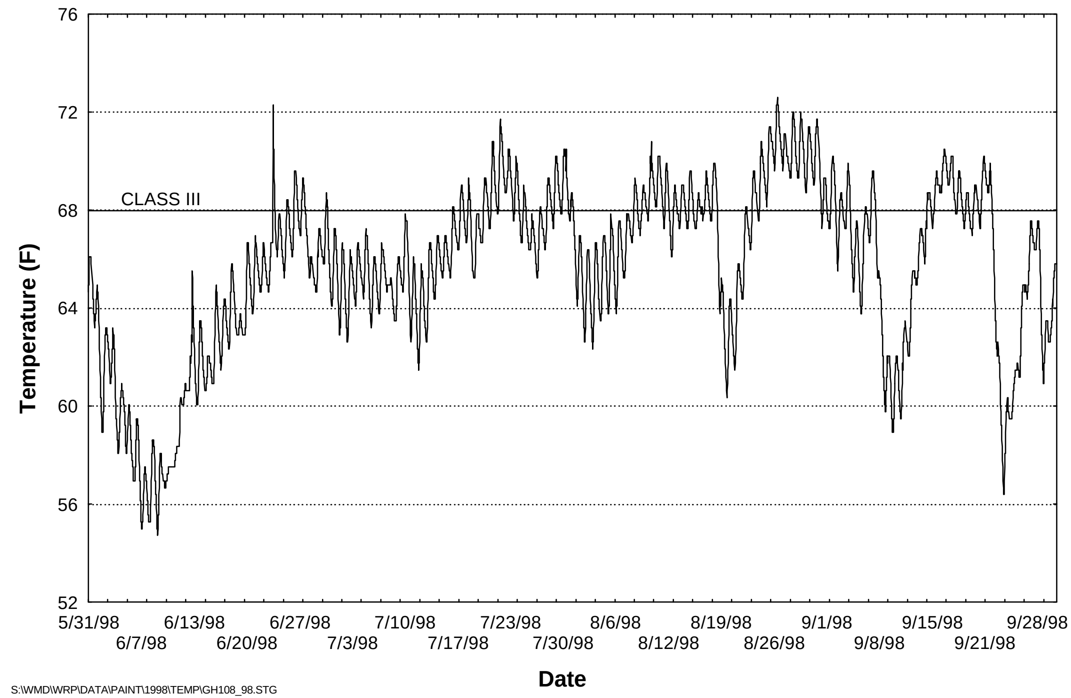

Figure 12. 1998 Water temperatures in Good Hope at PBGH108

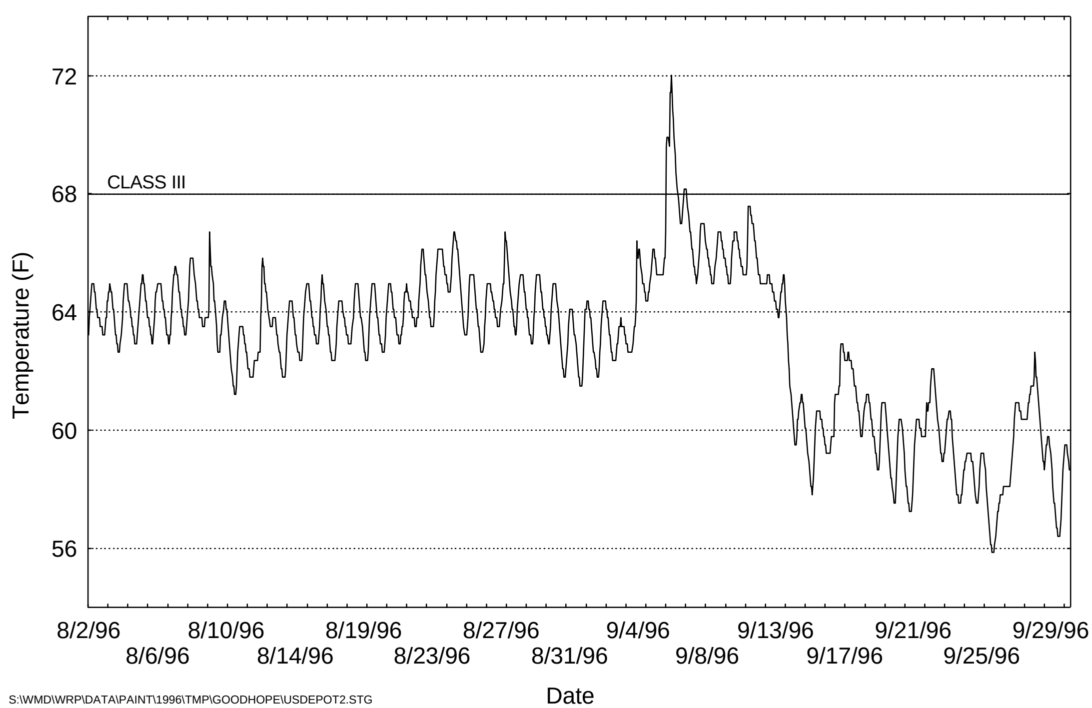

Figure 13. 1996 water temperatures upstream of the Colesvile Depot tributary

5.4.5 Reduce present sediment load

To maintain the present resource condition and the brown trout population of Good Hope it is absolutely critical that sediment load be reduced. As the values for embeddedness in the table below suggest sedimentation of riffle habitat is currently a problem in Good Hope and needs to be addressed. As mentioned above DEP is constructing several stormwater structures in the headwater areas of Good Hope which should help reduce the sediment load in this sensitive subwatershed. Any new land disturbance must take extraordinary measures to prevent sediment from entering this tributary. To determine if the goal of sediment reduction is achieved DEP will use the indicators listed in the following table.

Performance Indicators	Peachwood Park (PBGH-108)			Hobbs Dr. (PBGH-208)		
	Mean	**N**	**Std. Error**	**Mean**	**N**	**Std. Error**
percent of embeddedness	58%	2	NA	45%	2	NA
pool deposition (feet)	.01	10	+/- .01	.04	9	+/- .02
D50	32mm - 64mm			16mm - 32mm		

5.5 MAINSTEM PERFORMANCE GOALS

DEP monitors the habitat and biological condition at two locations on the Upper Paint Branch mainstem (above Fairland Rd.- PBPB305, and above Briggs Chaney Rd.- PBPB302). These two stations reflect the overall cumulative impacts from the headwater areas of Paint Branch and will therefore serve as a way of determining if critical natural resource parameters identified in this conservation plan are protected throughout the watershed.

5.5.1 Maintain present status of living resources

Presently the marcoinvertebrate and fish communities indicate that a "**good**" resource condition exists in both the upper mainstem (PBPB-302) and lower mainstem (PBPB-305). DEP will continue monitoring these communities to determine that resource condition remains at present level (figure 2).

5.5.2 Maintain present hydrology

Indicators used to monitor for alterations to the hydrology of Paint Branch mainstem are presented in the following table. The stability of these indicators is dependent on stable hydrology throughout Upper Paint Branch.

Performance Indiactors	Briggs Chaney Rd. (PBPB-302)			Fairland Rd. (PBPB-305)		
	Mean	**N**	**Std. Error**	**Mean**	**N**	**Std. Error**
% of channel width wetted	73.0	6	+/- 6.0	52.6	6	+/- 9.4
width/depth ratio	17.4	1	NA	13.4	1	NA
entrenchment ratio	1.1	1	NA	1.2	1	NA

5.5.3 Maintain present condition of stream habitat

Parameters used to determine if in-stream habitat structure remains in present condition are presented in the following table. These percentages must remain stable in order to maintain the diverse biological community that presently is found in Paint Branch mainstem.

Performance Indicators	Briggs Chaney Rd. (PBPB-302)			Fairland Rd. (PBPB-305)		
	Mean	**N**	**Std. Error**	**Mean**	**N**	**Std. Error**
percentage of riffles	21.6	3	+/- 7.2	25.3	3	+/- 4.9
percentage of pools	30.2	3	+/- 3.7	19.2	3	+/- 1.8
% veg. cover (right bank)	70.1	6	+/- 7.5	64.8	6	+/- 11.5
% veg. cover (left bank)	62.7	6	+/- 15.8	78.8	6	+/- 8.5
Bank Stability	11.8	6	+/- 1.3	12.8	5	+/- 1.0

5.5.4 Minimize increases to water temperature

DEP monitored water temperature in Paint Branch mainstem at station PBPB-302 during the summer months of 1996. These data show that average baseflow temperatures stay below the 68^0F criteria set by the State Water Use Standards (COMAR 26.08.02.03-3).. A summary of temperature monitoring in the mainstem is presented in the following table. The thermograph presented in figure 14 shows water temperature briefly exceeds the 68^0F criteria during peak daytime hours.

(summary period is from 8/1 - 9/30;)

Location	Mean	N	Median	Max.	Min.	STD
PBPB-305 (mainstem above Fairland Rd.)	64.7	1449	65.5	71.7	55.6	3.2

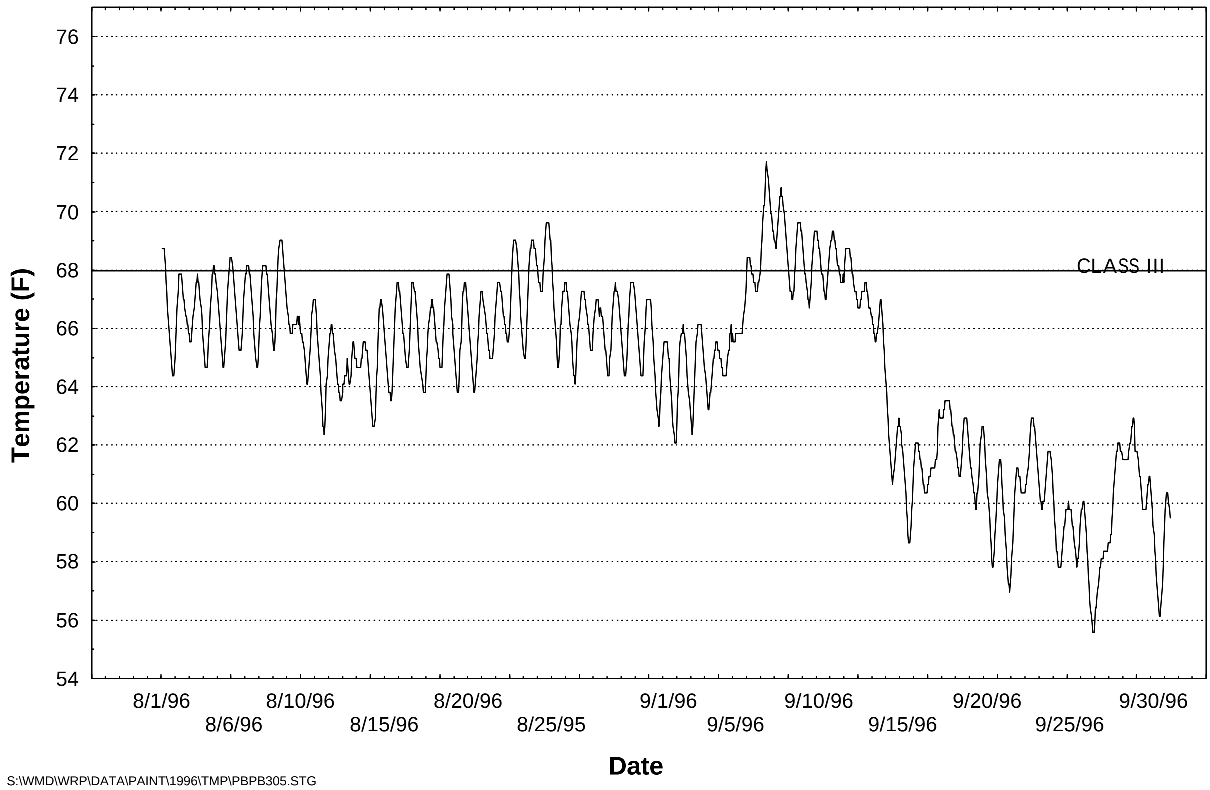

Figure 14. 1996 water temperature in Paint Branch mainstem at PBPB305

5.5.5 Maintain or reduce present sediment load

To maintain the present resource condition found in the mainstem of Paint Branch it is absolutely critical that sediment loads not increase. Measurements of embeddedness at both mainstem stations is high and could be limiting biological productivity. The following indicators will be used to assess trends in sedimentation rates at two mainstem stations.

Performance Indicators	**Briggs Chaney Rd. (PBPB-302)**			**Fairland Rd. (PBPB-305)**		
	Mean	**N**	**Std. Error**	**Mean**	**N**	**Std. Error**
percent of embeddedness	53%	2	NA	48%	2	NA
pool deposition (feet)	.01	7	+/- .00	.05	4	+/- .02
D50	32mm - 64mm			32mm - 64mm		

6.0 CONCLUSION

Three years of monitoring in the Upper Paint Branch SPA has resulted in an understanding of those natural resource parameters that need to be protected in order to maintain the high level of water quality that currently exists. The performance goals identified in this conservation plan should be incorporated into the water quality plans of future development in the Upper Paint Branch SPA. They were selected to maintain or improve those natural resource parameters critical to the overall ecological health of this watershed. By incorporating these performance goals into site design early in the review process a high level of water quality should be maintained. DEP will be utilizing the same parameters presented in this document to determine whether or not achievement of our overall goal of protecting the very fragile and diverse ecosystem that presently makes this watershed so unique is met. It is hoped that dialogue early in the development process will result in the protection of this valuable county resource.

In addition to the more rigorous review process for new development in Upper Paint Branch (as required by SPA regulation), DEP has initiated a systematic approach to identify and fix problems caused by existing development that presently threaten habitat and water quality. This effort is funded through the Capital Improvements Program and has resulted in the *Upper Paint Branch Watershed Stormwater Management/Stream Restoration Report*, which identifies 67 potential projects throughout the watershed to address existing problems of degraded stream condition. These 67 projects were priority ranked by an inter-agency team of professionals from DEP, M-NCPPC, MWCOG and Maryland Department of Natural Resources. From this list, six high priority projects were selected and are currently in the design phase. These six projects are located in the Good Hope subwatershed and include one new stormwater management pond (near Piping Rock Drive), a stormwater management pond retrofit (near Peachwood Road), one fish blockage removal project, two stream restoration projects and one wetland creation project. The next areas of focus for restoration projects are the Gum Springs and Right Fork subwatersheds.

DEP fully recognizes the value, in terms of quality of life for Montgomery County residents, that a resource like we have in Upper Paint Branch provides and is committed to the protection of this unique ecosystem for future Montgomery County residents to enjoy.